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2003

Online at <https://mpra.ub.uni-muenchen.de/54567/>

MPRA Paper No. 54567, posted 19 March 2014 07:07 UTC

ESTIMATING AND MEASURING THE AGRIBUSINESS GDP
AN APPLICATION TO THE BRAZILIAN ECONOMY, 1994 TO 2000

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AN APPLICATION TO THE BRAZILIAN ECONOMY, 1994 TO 2000^{*}

ABSTRACT

Through the use of input-output analysis and the system of national account, this paper presents new methodological insights in ways to estimate and to measure the Agribusiness GDP of a nation. The GDP of the Agribusiness is also estimated for two major complexes: a) Vegetal Products and b) Animal Products. Each of the Agribusiness complexes is divided into four components: a) inputs to agriculture; b) agriculture; c) agriculture based industry; and d) final distribution. Using data for the Brazilian economy it was possible to measure the GDP of Brazilian Agribusiness, which were estimated to be around 27% of the Brazilian GDP in 2000.

Key Words: Agribusiness, GDP, Input-Output

RESUMO

Utilizando-se de instrumentos de análise de insumo-produto e do sistema de contas nacionais, este trabalho apresenta nova metodologia para estimativa do PIB do Agronegócio de uma nação. O PIB do Agronegócio é também estimado para 2 grandes complexos: a) Produtos Vegetais; e b) Pecuária. Cada um destes complexos foi dividido em quatro componentes: a) insumos para a agricultura; b) agricultura; c) indústria de base agrícola; e d) distribuição final. Usando dados da economia brasileira foi possível estimar o PIB do Agronegócio brasileiro, o qual foi estimado por volta de 27% do PIB do Brasil em 2000.

Palavras-chave: Agronegócio, PIB, Insumo-Produto

^{*} The results presented here are part of a project being conducted at the Center for Advanced Studies in Applied Economics at the University of São Paulo (CEPEA-USP) under the financial support of the Brazilian National Confederation of Agriculture (CNA) and which is direct to define new methodologies to measure and to study the role of the Agribusiness in the Brazilian economy as a whole as well as in its regions. We would also like to acknowledge the partial financial support provided by CAPES, that made possible to present a previous version of this paper at the 13th International Conference on Input-Output Techniques, in Macerata – Italy, and we would also like to thank the comments received at this meeting.

1. INTRODUCTION

With the post-war worldwide technological revolution of agriculture, the farming activities underwent a large expansion and increasing specialization, decisively influenced by the economical development and growing urbanization. Such process basically imposed a new agricultural order in which the modern farmer is an expert involved with cultivation and animal breeding operations thus transferring the functions of storing, processing and distribution of vegetal/animal products as well as the supply of input and production factors to organizations other than the farm.

Previously focusing on self-sufficiency, agriculture was updated and introduced into the market economy constituting new links or segments to the feeding system. Basically this process resulted in the structuring of a modern industrial park providing capital goods and input for that area, a sector called **the rising tides** of the farm. On the other hand, complex storing, transportation, processing, industrialization and distribution networks were formed – **the ebb tide** sector.

To date the value of the agriculture-related activities performed outside the farms are substantially higher than those of the total operations performed therein. As an example, Lipton et al (1998) points the case of the United States, according to 1996 data, the share of Farming in the Food and Fiber System is only 7.1%, while Inputs have a share of 29.6% and Manufacturing and Distribution a share of 63.3%. The GDP of the Food and Fiber System was estimated by the authors to be US\$ 997.7 billion, i.e., 13.1% of United States GDP. The System employs a total of 22,694 thousand workers, which represent 16.9% of total U.S. employment, with the rural jobs representing only 1% of the total jobs of the country.

As a result of such phenomenon, the traditional economy concept that classifies the different activities as “primary, secondary and tertiary” sectors as separate and not integrated led to an analysis focusing on an interlinked system of production, processing and distribution of farming-originated products – **the Agribusiness**.

The pioneering academic contribution to quantify such conceptual approach was done by Davis & Goldberg (1957) when they created the term **Agribusiness**. Making use of input-output matrix techniques developed by Wassily Leontief (Leontief, 1951), the authors studied the transformations and restructuring of agriculture. By analyzing the problems related to the agricultural sector of the economy they stated that these were much more complex and not limited to an ordinary rural activity. That explains the need of dealing with agricultural problems under a systemic focus (Agribusiness) instead of a static one (agriculture).

Such expansion and specialization process of the agriculture is known to have occurred homogeneously in all regions of the planet, for it depends on the economic and social stage of development of each one of them. Namely, the participation and interaction of the agents – farmers, input suppliers and production factors, processors and distributors – occurred in different degrees in the various levels of the agricultural-feeding system (Pinazza & Araújo, 1993).

This worldwide transformation process also occurred in the Brazilian agriculture system with the agriculture and the stock raising activities being redirected, updated and integrated into the market. The transformations and restructuring of the rural sector started in the 1950s with and effective participation of the Brazilian government.

During the post-1950s period, the modernization process of the agriculture begins a more advanced phase, i.e., that of the industrialization, “... which represents the fundamental qualitative change in the long process of transformation of technical grounds, thus making the modernization process irreversible” (See Kageyama, 1990).

A great deal of these transformations were intensified by: a) the National System of Rural Credit through the use of subsidized credit; and b) by the II National Development Plan (1974/79) that made it ease to import agriculture machinery. (Barros, 1983)

This process helped in the consolidation of the Brazilian Agribusiness, that took place through the intersectoral integration among the industries that produce for the agriculture, the agriculture itself, the processing industries, and the distribution. The agricultural production then becomes part of a chain and

depends on the industry dynamics, that is, there is an increasing integration between agriculture and industry in which the agriculture/industry cut becomes less important.

In view of these considerations, it is clear that the integration between agriculture and industry implies a real restructuring of the rural sector, establishing deep technological, productive, financial and business relationships with the other economy activities.

In Brazil, surveys on Agribusiness are scarce, and the researches available constantly involve problems regarding scope and periodicity. In features regarding the feeding issue the functional approach still prevails, as in the economic literature the analysis of agriculture so to speak also prevails. The Brazilian Institute of Geography and Statistics (IBGE) releases information on national accounts, integrated with input-output tables, such that from this data it is possible to make a study of the Brazilian agriculture in the Agribusiness scope developed this paper.

In this way, this paper presents the estimation made for the Brazilian Agribusiness GDP in the 1994/2000 time period. From these results it is possible to make economic evaluations so as to subsidize sectoral policy planning to the agribusiness management, as well as to detect fundamental elements of this new agricultural pattern, in order to help redirect the rural producer as an economic agent. The Brazilian Agribusiness GDP estimates are also decomposed into two major complexes, Vegetal and Animal products.

The next section will present the methodology developed in this work, section 3 will present the results for the Brazilian economy, while the final remarks are made in the last section.

1. INTRODUÇÃO

O debate sobre o desenvolvimento econômico nos seus impactos sobre as atividades setoriais da economia nos países capitalistas tem, historicamente, como observado por Bacha & Rocha (1998), enfocado as tendências seculares do processo de transformação da sociedade pautado em atividades urbano-industriais, onde o setor primário desempenha um papel de transferência de capital, mão-de-obra e geração de divisas para a importação de bens de capital. Nessa conceituação

tradicional, o setor agropecuário vai paulatinamente perdendo importância relativa na composição do Produto Interno Bruto (PIB) das economias, assumindo um papel subalterno no processo econômico dos países.

Entretanto, essa formulação tradicional e estática do campo tem sido deixada de lado cada vez mais, pelos analistas econômicos, em favor de uma visão sistêmica da agropecuária inserindo a nova dinâmica da transformação setorial rural onde está presente a abordagem integradora de cadeia de produção – o agronegócio –, reflexo de mudanças estruturais profundas na economia mundial (Streeter et al, 1991; Furtuoso, 1998).

O setor agropecuário, ao longo das últimas décadas, acompanhando essas transformações, evoluiu, modernizando-se, inserindo-se na economia de mercado e formando complexas redes de armazenamento, processamento, industrialização e distribuição, com crescente estreitamento da relação agricultura/indústria e aprofundamento das relações tecnológicas, produtivas e financeiras. Basicamente, esse processo resultou na estruturação de um moderno parque industrial que fornece bens de capital e insumos para o campo, setor denominado **a montante** da fazenda. Por outro lado, formaram-se o setor **a jusante** que compreende os segmentos responsáveis pela industrialização e distribuição.

Essa nova realidade da agricultura, como elemento estratégico de um grande ramo de negócio na economia moderna, mostra um segmento forte, altamente dinâmico, conectado com toda a economia e com desempenho relevante no processo de desenvolvimento econômico. A “nova economia” agrícola – o agronegócio – exige o rompimento com preceitos clássicos das análises da agricultura sendo fundamental ressaltar que o desenvolvimento do agronegócio é o caminho mais eficiente do país para adicionar valor sobre o produto agrícola produzido, propiciando novos mercados que possibilitam ampliação das exportações, geração de rendas e impostos para o país, como observado por Lauschner, 1993; Santana, 1994; entre outros.

Neste contexto, o presente trabalho tem como objetivo mensurar o PIB do agronegócio brasileiro no período de 1994 a 2000, decompondo essas estimativas nos dois grandes sub-

complexos – agricultura e pecuária – que formam esse segmento econômico como, também, detectar a participação dos setores processadores (indústria de base agrícola) que compõem o agronegócio brasileiro, com fins de identificar algumas trajetórias de seu desenvolvimento, especialmente no processo de intensificação de abertura comercial e das reformas estruturais que caracterizam o período em análise.

A seção a seguir descreve a metodologia adotada no processo de mensuração do PIB do agronegócio, que incorpora abordagem metodológica eliminando o problema de dupla contagem usualmente presente nestas estimativas. As seções seguintes trazem os resultados do cálculo do agronegócio brasileiro com suas conclusões e implicações finais.

2. METHODOLOGY TO MEASURE THE AGRIBUSINESS SYSTEM

2. ASPECTOS CONCEITUAIS E METODOLÓGICOS

Define-se formalmente o agronegócio como sendo o conjunto formado pela sucessão de atividades vinculadas à produção e transformação de produtos agropecuários e florestais (Muller, 1989). Esse conjunto de atividades agrícolas e industriais são interdependentes, mas heterogêneos quanto ao grau de importância na evolução do complexo. Esta definição foi batizada pelo termo “*agribusiness*” por Davis & Goldberg (1957), que o descreveram como sendo a “soma total das operações de produção e distribuição de suprimentos agrícolas; as operações de produção na fazenda; e o armazenamento, processamento e distribuição dos produtos agrícolas e itens produzidos a partir deles”. No Brasil, a abordagem sistêmica foi adotada pioneiramente por Araújo et al (1990).

Cabe destacar, no entanto, que embora o enfoque sistêmico na agricultura esteja cada vez mais disseminado na literatura econômica, há discordâncias nas formulações metodológicas adotadas resultando valores díspares sobre a contribuição desse segmento para a formação do Produto Interno Bruto nacional (Farina, 1988; Montoya & Finamore, 2001).

Nunes & Contini (2000) utilizando conceitos macro econômicos adotados no Sistema de Contas Nacionais dimensionaram o PIB do complexo agroindustrial brasileiro relativo ao ano de 1996. As atividades e produtos do CAI classificadas como agroindústria e serviços foram separadas em atividades Exclusivas do CAI e Pertencentes Parcialmente ao CAI. Para as atividades com predominância não CAI considerou-se apenas a proporção dos insumos provenientes do CAI para o

valor da produção e do consumo intermediário. Para as atividades com predominância de produtos do CAI, subtraiu-se as não pertencentes a este, adotando-se o mesmo procedimento de proporcionalidade.

A preocupação com a necessidade de aperfeiçoamento metodológico para mensuração desse importante ramo de negócio assim como a magnitude real do seu PIB no período pós-Real levou a realização dessa pesquisa. O conhecimento desse indicador econômico é fundamental para efeito de subsídios aos formuladores de política econômica e tomadores de decisão no âmbito governamental e privado.

Para a análise do agronegócio brasileiro, referente ao período 1994 a 2000, utiliza-se a matriz de insumo-produto, desenvolvida por Leontief (1951), e que se encontra integrada ao sistema de contas nacionais.

Besides measuring the Agribusiness as whole for the economy, in this paper the Agribusiness was also measured for two major complexes: Vegetal Products and Animal Products. Further methodological discussions on the estimation of the Agribusiness Complex can be found on the works of Furtuoso (1998), Furtuoso, Barros and Guilhoto (1998), and Guilhoto, Furtuoso, and Barros (2000).

The total GDP value of the Agribusiness in each complex will also be divided into 4 aggregates: I) inputs; II) the sector itself; III) industrial processing; and IV) distribution and services.

The procedure adopted to estimate the Agribusiness GDP is through the scope of the Product, i.e., by estimating the value added at market prices, and, it is taking into consideration the methodology presented by the System of National Accounts defined by the United Nations (SNA, 1993), where the input-output matrices are integrated in this system.

The value added at market prices is given by the sum of the value added at basic prices with indirect net taxes less the financial dummy, resulting in:

$$VA_{MP} = VA_{BP} + INT - FDu \quad (1)$$

where:

VA_{MP} = Value added at market prices

VA_{BP} = Value added at basic prices

INT = Indirect net taxes

FDu = Financial dummy

To estimate the GDP of **Aggregate I** (input for vegetal and animal production) one uses the information available in the input-output tables regarding the input values acquired by the Vegetal and Animal sectors. The columns with input values are multiplied by the respective coefficient of value added (CVA_i).

The Coefficients of the Value Added for each sector (CVA_i) are obtained by dividing the Value Added at Market Prices (VA_{MP}) of a given sector by its respective output (X_i), i.e.,

$$CVA_i = \frac{VA_{MP}}{X_i} \quad (2)$$

Thus, the double-counting issue presented by previous Agribusiness GDP estimates in the Brazilian Economy when input values were considered, instead of the value added effectively generated by it, is eliminated. In that sense the GDP of the **Aggregate I** is given by:

$$GDP_{I_k} = \sum_{i=1}^n z_{ik} * CVA_i \quad (3)$$

$k = 1, 2$ vegetal and animal sectors

$i = 1, 2, \dots, 43$ all the economic sectors

where:

GDP_{I_k} = GDP of aggregate I (input) for vegetal ($k=1$) and animal ($k=2$)

z_{ik} = total input value of sector i for either vegetal or animal

CVA_i = value added coefficient of sector i

For the total Aggregate I we have:

$$GDP_I = GDP_{I_1} + GDP_{I_2} \quad (4)$$

where:

GDP_I = GDP of aggregate I

and the other variables are as previously defined.

The estimates for the **Aggregate II** (the sector itself, vegetal and animal) considers the value added generated by the respective sectors, subtracting the values used as input from the value added of these sectors, thus the double-counting issue found in the previous Agribusiness GDP estimates for the Brazilian economy is again eliminated. Then one has:

$$GDP_{II_k} = VA_{MP_k} - \sum_{i=1}^2 z_{ik} * CVA_i$$

$$k = 1, 2$$
(5)

where:

GDP_{II_k} = GDP of aggregate II for vegetal ($k = 1$) and animal ($k = 2$)

and the other variables are as previously defined.

For the total Aggregate II we have:

$$GDP_{II} = GDP_{II_1} + GDP_{II_2}$$
(6)

where:

GDP_{II} = GDP of aggregate II

and the other variables are as previously defined.

To define the composition of the **Aggregate III** (agriculture based industries) several indicators were adopted as for instance: a) the main demanding sectors of agricultural products obtained by input-output matrix estimation; b) the share of agricultural input in the intermediate consumption the agroindustrial sectors; and c) the economic activities carrying out the first, second and third transformation of agricultural raw materials. In this way, the agriculture based industries are the following activities: i) Wood and Wood Products; ii) Pulp, Paper and Printing; iii) Processing of Chemical Elements (Alcohol); iv) Textile; v) Clothing; vi) Footwear, Leather and Skins; vii) Coffee Industry; viii) Vegetal Products Processing; ix) Animal Slaughtering; x) Dairy Industry; xi) Sugar Industry; xii) Vegetal Oil Processing; and xiii) Other Food Products.

The input-output matrix data for 1995 shows that out of the total output of vegetal and animal production for intermediary purposes, 21.8% is absorbed by the rural sector, 71.8% is sold to the agriculture based industries and only 6.4% is designated to the remaining sectors.

In the estimation of **Aggregate III** (Agriculture Based Industries) one adopted the summation of the value added generated by the agroindustrial sectors subtracted from the value added of these sectors that have been used as input in the Aggregate II. As previously mentioned, this subtraction is done to eliminate the double-counting found in previous Agribusiness GDP estimates, as so, one has that:

$$GDP_{III_k} = \sum_{q \in k} VA_{MP_q} - z_{qk} * CVA_q \quad (7)$$

$$k = 1, 2$$

where:

GDP_{III_k} = GDP of aggregate III for vegetal products ($k = 1$) and animal products ($k = 2$)

and the other variables are as previously defined.

For the total Aggregate III we have:

$$GDP_{III} = GDP_{III_1} + GDP_{III_2} \quad (8)$$

where:

GDP_{III} = GDP of aggregate III

and the other variables are as previously defined.

In the case of **Aggregate IV**, regarding the Final Distribution, one considers the aggregated value of the Transportation, Commerce and Service sectors. Out of the total value obtained for these sectors only the part corresponding to the share of the agricultural and agroindustrial products is designated to the Agribusiness in the final product demand. The approach adopted in the estimation of the final distribution value of the industrial agribusiness can be represented by:

$$GFD - INT_{FD} - IP_{ED} = DFD \quad (9)$$

$$VAT_{MP} + VAC_{MP} + VAS_{MP} = TM \quad (10)$$

$$GDP_{IV_k} = TM * \frac{FD_k + \sum_{q \in k} FD_q}{DFD} \quad (11)$$

$k = 1, 2$

where:

GFD = global final demand

INT_{FD} = indirect net taxes paid by the final demand

IP_{FD} = imported products by the final demand

DFD = domestic final demand

VAT_{MP} = value added of the transportation sector at market prices

VAC_{MP} = value added of the commerce sector at market prices

VAS_{MP} = value added of the service sector at market prices

TM = trading margin

FD_k = final demand of vegetal ($k=1$) and animal ($k=2$)

FD_q = final demand of the agroindustrial sectors

GDP_{IV_k} = GDP of aggregate IV for vegetal ($k=1$) and animal ($k=2$)

For the total Aggregate IV we have:

$$GDP_{IV} = GDP_{IV_1} + GDP_{IV_2} \quad (12)$$

where:

GDP_{IV} = GDP of aggregate IV

and the other variables are as previously defined.

The Agribusiness GDP for each sub-complex is given by the sum of its aggregates as:

$$GDP_{Agribusiness_k} = GDP_{I_k} + GDP_{II_k} + GDP_{III_k} + GDP_{IV_k} \quad (13)$$

where:

$GDP_{Agribusiness_k}$ = GDP of the agribusiness for vegetal products ($k=1$) and animal products ($k=2$)

and the other variables are as previously defined.

The total Agribusiness GDP is given by:

$$GDP_{Agribusiness} = GDP_{Agribusiness_1} + GDP_{Agribusiness_2} \quad (14)$$

where:

$$GDP_{Agribusiness} = \text{Agribusiness GDP}$$

and the other variables are as previously defined.

The methodology described above is showed in Figure 1. In this way, the Agribusiness GDP can be obtainable either by the weighed sum of the aggregates GDP or by the weighed sum of the GDP of the Vegetal and Animal Products.

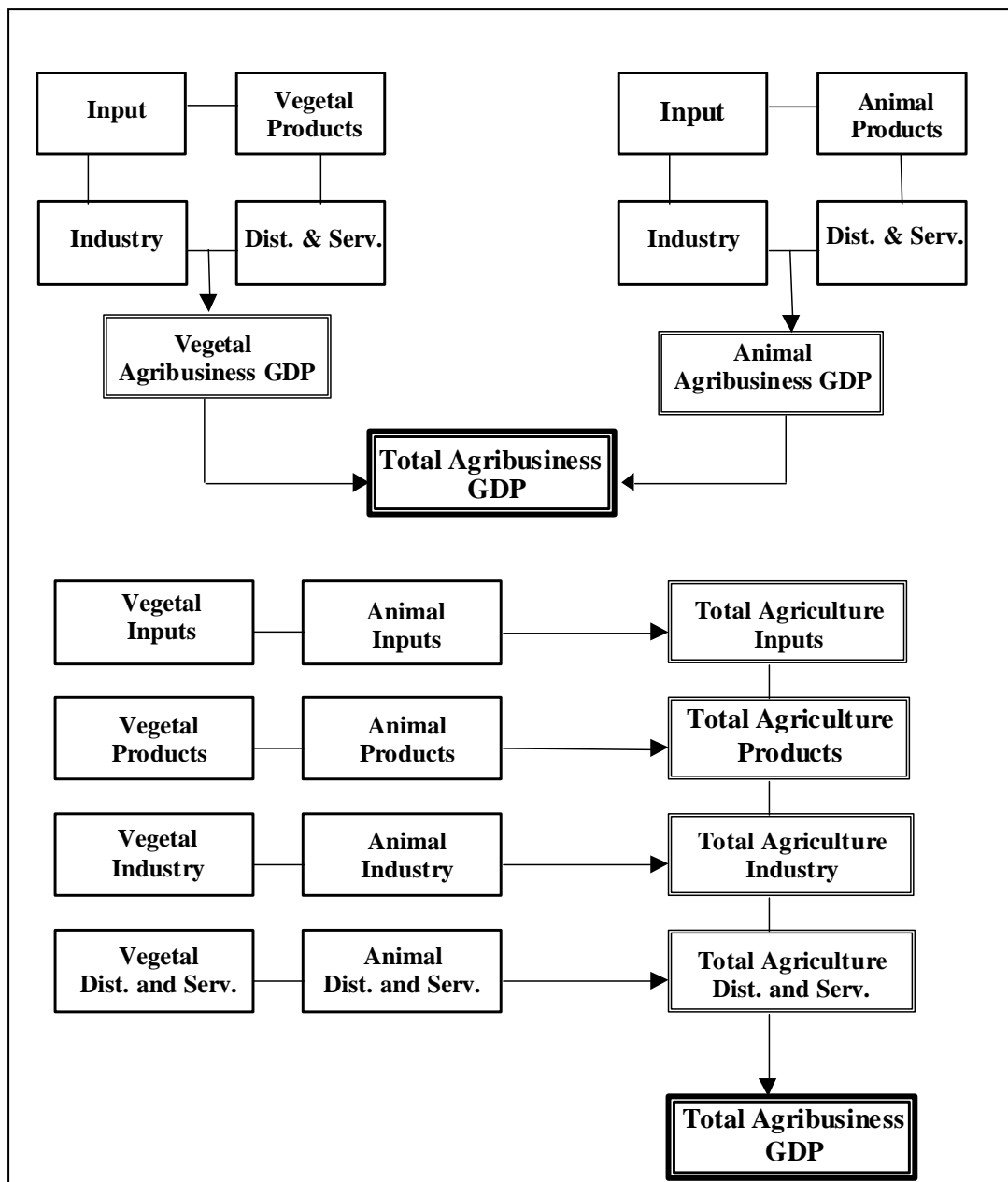


Figure 1. Obtaining the Agribusiness GDP.

To obtain the contribution of each industrial sector to the Agribusiness GDP the following is done: a) the agribusiness value is estimated, should there be no industrial sectors, according to the methodology described above; and b) also according to this methodology, each industrial sector is inserted, one by one, into the agribusiness complex, thus, by subtraction it is possible to estimate the contribution of each processing industry to the total agribusiness.

3. THE BRAZILIAN AGRIBUSINESS, 1994 TO 2000

The results for the Brazilian Agribusiness point out the importance that such complex has played in the national economy, accounting for approximately 27% of its GDP in 2000.

Table 1 presents the shares of the Agribusiness GDP in the Brazilian economy for the 1994-2000 period. The Brazilian Agribusiness GDP accounted for 30.4% of Brazil's GDP in 1994, having a declining trend until 1997 (27.7%). *Esses números de participação do PIB do agronegócio no PIB Nacional diferem dos 20,6% estimados por Nunes & Contini (2000). Embora o trabalho da ABAG derivem das mesmas bases de cálculo do presente trabalho, a matriz de insumo-produto de 1996 – IBGE, essas diferenças são devido a questões metodológicas diferenciadas. Para o cálculo do agronegócio brasileiro no presente trabalho foi adotada a metodologia desenvolvida por Guilhoto et al (2000) e que representa uma consolidação dos diversos procedimentos metodológicos utilizados para esse tipo de cálculo, além de introduzir procedimentos que eliminam o problema de dupla contagem presente nessas estimativas.*

The GDP of the Brazilian Agribusiness for 2000 was estimated to be US\$ 167.7 billions. Which represent a small growth over the value observed in 1994 (US\$ 163.0 billion) and being the same value as the one observed for 1995.

O processo de desenvolvimento econômico brasileiro tem reproduzido a tendência do desenvolvimento econômico dos países capitalistas apresentando taxas de crescimento setoriais diferenciadas entre agricultura, indústria, serviços, onde os setores industrial e de serviço tendem a apresentarem taxas de crescimento, a longo prazo, superiores à agricultura.

Num setor agrícola dinâmico inter-conectado ao resto da economia, com ligações à montante e à jusante fortes, o seu padrão de crescimento passa a ser mais complexo e a depender da conjugação dos seus vários componentes (primário, secundário, terciário).

Embora o valor do agronegócio brasileiro, no período 1994-2000, praticamente não tenha mudado em termos absolutos, sua participação no PIB nacional se mostra com tendência declinante. Essa redução se dá, principalmente, pelo dinamismo dos outros complexos industriais e do setor de serviços. É importante considerar as reformas estruturais porque vem passando o país como também o processo de abertura econômica que marcaram toda a década de 90 e refletem nesse resultado, uma vez que fazem com que o PIB total cresça mais rapidamente do que o PIB do agronegócio.

A variação real anual do PIB do agronegócio brasileiro a preços de mercado, para o período 1994-2000, mostra taxas de crescimento menores que a taxa de crescimento do PIB nacional, excetuando o biênio 98-99. Em 2000, o PIB nacional cresceu em torno de 4,00% enquanto o agronegócio apresentou um ritmo menor (0,10%), indicando que o agronegócio perdeu participação no PIB. É certo que a forte apreciação cambial a partir de 1994, ano de início do Plano Real, e que permeou quase toda esta década, provocou forte redução nos preços agrícolas recebidos pelos produtores rurais brasileiros. Segundo Homem de Mello (1998) no período 1989/96 houve uma apreciação real da taxa de câmbio de 40,5%, enquanto os preços agrícolas reais acusaram redução de 41,1%, o que afeta drasticamente a rentabilidade agrícola. Em uma economia aberta ao comércio internacional a valoração da taxa de câmbio é fator chave para a rentabilidade das atividades produtivas, em especial a agricultura cuja tradição sempre foi voltada ao mercado exterior.

Observa-se, também, que nesse período ocorreu redução do apoio governamental através de menor utilização dos instrumentos de incentivo à expansão da produção agropecuária brasileira, o que, sem dúvida, implicou numa retração no PIB do agronegócio. Os gastos realizados pelo setor público na agricultura apresentaram declínio acentuado, a partir de 1986, como salientam Bacha & Rocha (1998) e Barros (1995).

Table 1
Agribusiness and Brazilian GDP: 1994 to 2000

Year	Agribusiness GDP US\$ Billion *	Agribusiness GDP Growth Rate (%)	Brazilian GDP US\$ Billion *	Agribusiness GDP Share (%)
1994	163.0	-	535.2	30.4
1995	167.7	2.92	557.8	30.1
1996	165.0	-1.62	572.6	28.8
1997	163.5	-0.89	591.3	27.7
1998	164.5	0.58	592.6	27.8
1999	167.5	1.85	597.3	28.0
2000	167.7	0.10	621.2	27.0

Source: CNA/CEPEA Research Data.

* The values for 2000 were converted from Brazilian Reais to U.S. dollars using the average exchange rate for this year. The results for the remaining time period were obtained by applying over the 2000 values the real growth rates, in Brazilian Reais, observed from 1994 to 1999.

Table 2 shows the evolution of the Brazilian Agribusiness GDP, both in global terms (total) and for the two sub-complexes, with corresponding segments for the 1994-2000 time period.

The shares of the components of the Agribusiness GDP (Tables 3 and 4) show that the input contribution has a growing trend for the total complex in the period. O setor industrial a montante mostra uma inserção no agronegócio que tende à maior tecnificação agrícola refletido no aumento da participação dos insumos de 4,6% para 5,7% do total entre 1994-2000. Certamente, esse maior consumo de insumos agrícolas deve-se, em grande parte, ao comportamento dos preços desses produtos no período. Com relação à evolução dos preços dos insumos agrícolas, Homem de Mello (1998) mostra que na década de 90 ocorreu uma expressiva redução de seus preços, ocasionada pela acentuada valorização cambial, por reduções tarifárias relevantes e por expressivos ganhos de eficiência das empresas.

The total agriculture have shown declining results from 1994 through 1997, an inverse trend was recorded from 1998 to 2000. Os dados referentes aos preços agrícolas mostram que ocorreram reduções sensíveis na década de 90. Entre 1989/97 os índices de preços agrícolas passaram de 100,0 para 72,4 (Homem de Mello, 1998). Por sua vez, excetuando o ano de 1994, constata-se tendência

de queda da relação preços recebidos/preços pagos na década, o que pode explicar, em parte, o comportamento do valor adicionado agrícola nesse período. É interessante notar que em 1997 registrou-se preços externos favoráveis de algumas *commodities*, em especial da soja. Adicionalmente, ocorreram ganhos de produtividade¹ e a inserção do ICMS nas exportações agrícolas (Lei Kandir) o que pode ter atuado como variáveis compensatórias sobre a agricultura no final dos anos 90.

The evolution of the Brazilian Agribusiness composition also shows the high shares of the Agriculture Based Industries and the Distribution segment, showing values always above 30%. In 2000 the Agriculture Based Industries and Distribution segments had a share of respectively 33.1% and 33.2% for the total Complex.

Tables 2 to 4 show the structure of the two major complexes of the Brazilian Agribusiness – Vegetal and Animal, in 2000 the Vegetal Agribusiness GDP of US\$ 115.5 billions represented 18.6% of Brazil's GDP, while the Animal Agribusiness GDP, US\$ 52.2 billions, corresponded to 8.4% of Brazil's GDP. In the case of the vegetal, the higher GDP share is justified by the diversity of the agricultural sector that has a higher number of processing industries than the animal sector.

The aggregate value derived from vegetal and animal products are made up by its output destiny, i.e.: a) inputs used in the agriculture; b) inputs used by the industries; c) exported; and d) final consumption by the families and the government. Given the above, one has that the value of the Total Agriculture GDP in 2000 was of US\$ 47.0 billions. Splitting the Total Agriculture GDP by the sub-complexes one has that in 2000 the total GDP for the Vegetal and Animal production was, respectively, of US\$ 24.9 billions and US\$ 22.1 billions (Table 2).

¹ Os estudos de Gasques e Conceição (1997) constataram o aumento da produtividade da agricultura brasileira.

Table 2 - Brazilian Agribusiness GDP, 1994 to 2000 (US\$ Billion of 2000*)

Complex	1994	1995	1996	1997	1998	1999	2000
Agriculture	163.0	167.7	165.0	163.5	164.5	167.5	167.7
Non Ag. Input	7.6	7.2	7.4	7.3	7.7	9.0	9.5
Total Agriculture	46.0	46.8	45.3	44.7	47.5	47.4	47.0
Used as Input	7.0	6.8	6.9	6.8	7.2	7.2	7.1
Sold	39.0	40.0	38.5	37.9	40.3	40.2	39.9
Industry	54.7	58.7	56.1	56.4	53.5	54.9	55.5
Distribution	54.7	54.9	56.2	55.1	55.8	56.2	55.6
Vegetal	117.5	119.7	118.6	118.8	117.8	117.9	115.5
Non Veg. Input	5.1	4.8	5.0	5.0	5.2	6.0	6.2
Vegetal	27.0	26.8	26.9	26.8	28.2	26.8	24.9
Used as Input	4.2	4.0	4.2	4.2	4.4	4.2	3.9
Sold	22.8	22.8	22.7	22.6	23.8	22.6	21.0
Industry	46.3	49.3	46.7	47.5	44.9	46.2	46.7
Distribution	39.2	38.6	40.0	39.5	39.4	39.0	37.9
Animal	45.4	48.1	46.4	44.7	46.7	49.6	52.2
Non Anim. Input	2.5	2.4	2.3	2.3	2.4	3.0	3.4
Animal	19.0	20.0	18.5	17.9	19.3	20.7	22.1
Used as Input	2.8	2.8	2.7	2.6	2.8	3.0	3.2
Sold	16.2	17.2	15.8	15.3	16.4	17.6	18.9
Industry	8.4	9.4	9.4	9.0	8.6	8.7	8.8
Distribution	15.5	16.3	16.1	15.6	16.4	17.2	17.8

Source: CNA/CEPEA Research Data.

* The values for 2000 were converted from Brazilian Reais to U.S. dollars using the average exchange rate for this year. The results for the remaining time period were obtained by applying over the 2000 values the real growth rates, in Brazilian Reais, observed from 1994 to 1999.

Table 3 - Brazilian Agribusiness Share Inside Each Complex, 1994 to 2000 (%)

Complex	1994	1995	1996	1997	1998	1999	2000
Agriculture	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Non Ag. Input	4.6	4.3	4.5	4.4	4.7	5.4	5.7
Total Agriculture	28.2	27.9	27.5	27.3	28.9	28.3	28.0
Used as Input	4.3	4.1	4.2	4.1	4.4	4.3	4.2
Sold	23.9	23.8	23.3	23.2	24.5	24.0	23.8
Industry	33.6	35.0	34.0	34.5	32.5	32.8	33.1
Distribution	33.6	32.8	34.0	33.7	34.0	33.5	33.2
Vegetal	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Non Veg. Input	4.3	4.0	4.2	4.2	4.5	5.1	5.3
Vegetal	23.0	22.4	22.7	22.6	24.0	22.7	21.5
Used as Input	3.6	3.4	3.5	3.5	3.7	3.5	3.4
Sold	19.4	19.1	19.1	19.1	20.2	19.2	18.2
Industry	39.4	41.2	39.4	40.0	38.1	39.2	40.4
Distribution	33.3	32.3	33.7	33.3	33.5	33.1	32.8
Animal	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Non Anim. Input	5.4	5.0	5.1	5.1	5.2	6.1	6.5
Animal	41.8	41.6	39.8	40.0	41.2	41.6	42.4
Used as Input	6.1	5.8	5.8	5.8	6.0	6.1	6.2
Sold	35.7	35.7	34.0	34.2	35.2	35.6	36.2
Industry	18.6	19.5	20.3	20.1	18.4	17.6	16.9
Distribution	34.2	33.9	34.8	34.9	35.1	34.7	34.1

Source: Table 2.

Table 4 - Share in the Brazilian Agribusiness GDP, 1994 to 2000 (%)

Complex	1994	1995	1996	1997	1998	1999	2000
Vegetal	72.1	71.3	71.9	72.7	71.6	70.4	68.9
Non Veg. Input	3.1	2.9	3.0	3.1	3.2	3.6	3.7
Vegetal	16.6	16.0	16.3	16.4	17.2	16.0	14.8
Used as Input	2.6	2.4	2.5	2.5	2.7	2.5	2.3
Sold	14.0	13.6	13.8	13.8	14.5	13.5	12.5
Industry	28.4	29.4	28.3	29.0	27.3	27.6	27.8
Distribution	24.0	23.0	24.3	24.2	24.0	23.3	22.6
Animal	27.9	28.7	28.1	27.3	28.4	29.6	31.1
Non Anim. Input	1.5	1.4	1.4	1.4	1.5	1.8	2.0
Animal	11.6	11.9	11.2	10.9	11.7	12.3	13.2
Used as Input	1.7	1.7	1.6	1.6	1.7	1.8	1.9
Sold	9.9	10.2	9.6	9.3	10.0	10.5	11.3
Industry	5.2	5.6	5.7	5.5	5.2	5.2	5.3
Distribution	9.5	9.7	9.8	9.5	10.0	10.3	10.6

Source: Table 2.

Regarding the annual growth of the sub-complexes one verifies that the Animal complex was the one presenting best results in 1999 and 2000, with real growth rates of 6.19% and 5.17%, respectively, in comparison with those of 0.13% and -2.03% for the Vegetal complex (Table 5).

Esses resultados vêm confirmar o favorável desempenho da pecuária brasileira que vem aumentando intensivamente, nesta década, a quantidade produzida de carnes (bovina, suína e avícola). Entre 1993 a 2000 a produção de carnes, expressa em peso de carcaças, cresceu em torno de 72,19%, atingindo o patamar de 10,3 milhões de toneladas (Silva, 2001). Em termos percentuais tem-se, respectivamente, para aves, suínos e bovinos os seguintes ganhos de crescimento de produção: 155,36%; 52,35% e 24,84%. Segundo Bacha & Rocha (1998), esse crescimento deve-se tanto ao aumento do número de animais abatidos como a elevação do rendimento médio de carne por animal abatido. Constata-se, portanto, que esses resultados refletem incrementos da produtividade, mas também indicam especialização na produção e na comercialização. A pecuária ganha destaque tanto pelo seu efetivo total como também pelo valor agregado ao produto final comercializado.

No que diz respeito ao comércio internacional, o setor de carnes vem apresentando ganhos sendo uma das opções da pauta exportadora do setor agropecuário. Em volume, entre 1993 a 2000,

as exportações de carnes bovina, suína e de aves *natura* apresentou crescimento total de 85,77%, passando das 675 para 1,254 milhões de toneladas (Silva, 2001). Apesar do resultado otimista alcançado pelo agronegócio da pecuária, a taxa de crescimento registrada para o total do sub-complexo e para a produção animal é inferior ao crescimento acumulado no ano do segmento dos insumos, no biênio 1999/2000, confirmando a tendência histórica de transferência de renda dos produtores para o segmento industrial.

Considering that the Agribusiness is a segment with agents from the primary (agriculture), secondary (industry), and tertiary (services) sectors, the changes in the GDP will be a function of the relative variation of its components.

Table 5 - Brazilian Agribusiness Growth Rates, 1995 to 2000 (%)						
Complex	1995	1996	1997	1998	1999	2000
Agriculture	2.92	-1.62	-0.89	0.58	1.85	0.10
Non Ag. Input	-4.08	1.67	-1.32	5.68	16.87	6.35
Total Agriculture	1.80	-3.19	-1.42	6.23	-0.11	-0.90
Used as Input	-2.02	0.46	-1.42	6.23	-0.11	-1.12
Sold	2.48	-3.81	-1.42	6.23	-0.11	-0.86
Industry	7.29	-4.39	0.57	-5.27	2.71	1.02
Distribution	0.45	2.24	-1.84	1.31	0.61	-0.96
Vegetal	1.79	-0.88	0.19	-0.88	0.13	-2.03
Non Veg. Input	-5.18	3.75	-0.35	4.95	13.63	3.24
Vegetal	-0.63	0.07	-0.21	5.24	-5.13	-7.14
Used as Input	-4.18	3.61	-0.25	5.28	-4.96	-7.14
Sold	0.03	-0.55	-0.20	5.24	-5.16	-7.14
Industry	6.64	-5.38	1.68	-5.48	2.93	1.00
Distribution	-1.36	3.61	-1.22	-0.24	-1.10	-2.93
Animal	5.84	-3.46	-3.62	4.44	6.19	5.17
Non Anim. Input	-1.78	-2.49	-3.39	7.28	23.84	12.50
Animal	5.26	-7.56	-3.19	7.71	7.25	7.19
Used as Input	1.25	-4.07	-3.24	7.75	7.46	7.19
Sold	5.94	-8.14	-3.18	7.71	7.21	7.19
Industry	10.83	0.81	-4.94	-4.16	1.57	1.17
Distribution	5.02	-1.02	-3.38	5.23	4.74	3.49

Source: Table 2.

The results show that out of the components considered for the estimation of the Total Agribusiness GDP in 1999, only the Total Agriculture had a negative variation of -0.11%, significantly contrasting with the positive performance of 6.23% reached in 1998. One can also

observe that the Inputs, the Agriculture Based Industries, and Distribution had positive variations in 1999, with respectively, real growth rates of 16.87%, 2.71% and 0.61%. In 2000, however, negative results were observed for the Agriculture and Distribution segment, with respectively, variations of -0,90 and -0,96 (Table 5).

Considering the annual growth rates of the components of the Vegetal Agribusiness GDP one notices that only the Input and Industry segments had a positive performance in 1999, with growth rates, respectively, of 13.63% and 2.93%, compensating the negative results of Agriculture (-5.13%) and Distribution (-1.10%). For 2000, only the industry kept a positive growth rate of 1.00% (Table 5).

Para isso, contribuiu a queda nos preços reais dos principais produtos agrícolas e o reajuste dos insumos, que refletiu nos custos dos produtores. Embora nos anos 90 tenha ocorrido um aumento da produtividade agrícola, não foi suficiente para alavancar a agricultura que não ultrapassou a produção de 80 milhões de toneladas de grãos (CNA, 2001).

Despite the negative context presented by the farming segment, the Animal Agribusiness Complex showed a positive performance from 1998 to 2000. Thus, in that complex the growth rates in 1999 were respectively 23.84%, 7.25%, 1.57% and 4.74% for the input, animal, processing and services segments. This complex has showed a similar performance for 2000 (Table 5).

When measured by a broader concept, the sectoral GDP data from 1994-2000 allows a more accurate technical evaluation regarding the sectoral performance of the Brazilian Agribusiness. These results are shown in Tables 6 and 7. The activity regarding the vegetal and animal products also includes the value of the inputs used plus the value aggregated with the distribution of the vegetal and animal products; the value for the agriculture based industries also includes the value aggregated with the distribution of the industries production. Using this broader concept, the value of the agricultural sector was responsible, in 2000, for 42.2% of Brazil's Total Agribusiness GDP.

Concerning the agriculture sector, the decrease of the GDP value in 1996 and 1997 can be interpreted as an economic backward movement (US\$65,8 billions in 1996 and US\$ 64,3 billions in

1997). After this period there was a recovery in 1998, 1999 and 2000, with growth rates of 8.02%, 1.77% and 0.10%, respectively. One should point the highly positive performance of the Animal sector in the more recent period, 1998 to 2000, with growth rates of 9.55%, 8.48% and 7.71%, respectively, which certainly reflected on the positive result of the rural sector in that triennial (8.02%, 1.77% and 0.10%, respectively).

Table 6 - Sectoral Distribution of the Brazilian Agribusiness GDP, 1995 to 2000 (US\$ Billion of 2000*)							
Sector	1994	1995	1996	1997	1998	1999	2000
Agriculture ⁽¹⁾	66.7	67.8	65.8	64.3	69.5	70.7	70.8
Vegetal ⁽¹⁾	39.4	39.1	39.2	38.8	41.6	40.4	38.1
Animal ⁽¹⁾	27.3	28.7	26.6	25.5	28.0	30.3	32.7
Wood & Wood Products ⁽²⁾	8.3	8.7	8.5	8.2	7.6	7.6	7.9
Pulp, Paper & Printing ⁽²⁾	7.2	9.0	8.4	8.0	7.5	9.0	10.6
Chemical Elem. (Alcohol) ⁽²⁾	7.9	6.2	6.0	7.4	6.3	7.1	7.2
Textile Industry ⁽²⁾	7.4	7.6	6.9	6.3	5.4	5.7	5.6
Clothing Industry ⁽²⁾	8.0	8.4	8.3	7.4	7.1	6.0	5.8
Footwear Industry ⁽²⁾	4.6	4.3	4.3	4.1	3.3	3.1	3.0
Coffee Industry ⁽²⁾	3.7	3.1	3.2	3.1	4.1	4.4	4.3
Vegetal Products Processing ⁽²⁾	12.9	12.7	13.5	14.3	13.1	12.4	11.2
Animal Slaughtering ⁽²⁾	9.8	10.4	10.6	10.3	10.5	11.7	11.8
Dairy Industry ⁽²⁾	3.8	4.6	4.9	4.9	5.0	4.5	4.7
Sugar Industry ⁽²⁾	2.8	2.5	2.5	2.6	2.6	2.5	2.9
Vegetal Oil Processing ⁽²⁾	4.8	4.5	4.5	5.1	4.8	4.6	3.7
Other Food Products ⁽²⁾	15.3	17.8	17.6	17.6	17.8	18.0	18.2
Total	163.0	167.7	165.0	163.5	164.5	167.5	167.7

Source: CNA/CEPEA-USP Research Data.

(1) These values refer to the sum of the aggregated value generated by: a) the sector; b) the inputs used; and c) the distribution.

(2) These values refer to the sum of the aggregated value generated by: a) the industrial sector; and b) the distribution.

* The values for 2000 were converted from Brazilian Reais to U.S. dollars using the average exchange rate for this year. The results for the remaining time period were obtained by applying over the 2000 values the real growth rates, in Brazilian Reais, observed from 1994 to 1999.

**Table 7 - Real Growth Rates (%) of the Sectoral Distribution of the
Brazilian Agribusiness GDP, 1995 to 2000**

Sector	1995	1996	1997	1998	1999	2000
Agriculture	1.67	-2.99	-2.20	8.02	1.77	0.10
Vegetal	-0.75	0.27	-1.00	7.01	-2.75	-5.61
Animal	5.10	-7.36	-3.97	9.55	8.48	7.71
Wood & Wood Products	4.99	-2.29	-2.73	-8.03	0.41	3.55
Pulp, Paper and Printing	24.85	-6.49	-5.22	-6.14	20.81	17.94
Chemical Elem. (Alcohol)	-20.98	-4.02	24.67	-15.28	12.97	1.18
Textile Industry	2.30	-8.49	-9.70	-13.13	5.77	-1.78
Clothing Industry	5.50	-1.43	-9.87	-5.21	-14.76	-4.42
Footwear Industry	-5.11	-1.19	-4.58	-19.01	-6.61	-1.38
Coffee Industry	-15.38	4.10	-3.58	32.11	7.09	-3.54
Vegetal Products Processing	-1.61	6.12	5.94	-7.90	-5.73	-9.88
Animal Slaughtering	6.55	2.25	-3.43	1.96	11.67	0.84
Dairy Industry	22.38	5.80	-1.31	2.57	-9.72	3.76
Sugar Industry	-7.98	-3.57	4.21	-0.13	-1.34	12.91
Vegetal Oil Processing	-5.71	0.89	12.42	-6.50	-3.17	-18.94
Other Food Products	16.25	-1.15	-0.27	1.06	1.51	1.07
Total	2.92	-1.62	-0.89	0.58	1.85	0.10

Source: Table 6

More recently, despite the not so significant growth of the Total Agribusiness GDP (1.85%) in 1999 and 2000 (0.10%), some industrial sectors managed to overcome the drawbacks and present highly satisfactory results. The Pulp, Paper and Printing industry had a GDP growth of 20.81% and 17.94% in 1999 and 2000, respectively, going from US\$ 7.5 billions in 1998 to US\$ 9.0 billions in 1999 and US\$ 10.6 in 2000 (Table 6 and 7).

In the case of the Chemical Elements (Alcohol) industry the GDP growth in 1999 was 12.97%, reaching the mark of US\$ 7.1 billions. In 2000, this segment had a growth of 1.18%. The Animal Slaughtering industry recorded a significant variation of 11.67% in 1999, increasing its aggregated value from US\$ 10.5 billions in 1998 to US\$ 11.7 billions in 1999. In 2000 the growth was only of 0.84%. The Coffee and Textile industries had growth rates of 7.09% and 5.77%, respectively, in 1999. In 2000, diverging from these results, the segments had results of -3.54% and 1.78%, respectively. Among the sectors, the poorest performance was that of the Clothing industry, which has been showing negative growth rates since 1996, with a reduction of 14.76%, with its GDP in 1999, going from US\$ 8.4 billions in 1995 to US\$ 5.8 billions in 2000. The Vegetal Oil

Processing Industry is also other sector that is losing share in the agribusiness, going from a value of US\$ 4.8 billion in 1994 to a value of US\$3.7 billion in 2000 (Tables 6 and 7).

The results obtained for the Brazilian Agribusiness confirm the behavior trend observed in highly industrialized economies, in which the share of the agriculture based industries and final distribution tends to be more and more representative in the value of the output sold by farmers. In that process, the vegetal and animal sector becomes less important in the composition of the Agribusiness output, with a relative sector's income decrease as can be observed in the works of Davis and Goldberg (1957), Lipton et al. (1998), Lauschner (1993), and Malassis (1968).

Through the data presented here, it is possible to see that the Brazilian agriculture is inserted into the current trend of the world's economy by adapting itself to the situation of the consumers, concentrated on the urban regions, with sophisticated consuming structures in which a larger participation of industrialized and diversified products is a constant demand.

In short, the Brazilian Agribusiness adds value on the agricultural raw materials in which the warehousing, processing and final distribution sector tends to be more representative of the total value of the output sold to the consumer, thus dominating the agriculture/industry relationships.

In that sense, it is fundamental to take into account the necessary organization of farming producers into associations, cooperatives or other alternative means to support rural producers, as it allows rural workers to face the challenges of this new agrarian pattern, leading to a relative reduction of the rural sector in relationship with the other Agribusiness components.

4. FINAL COMMENTS

By analyzing the results presented in this paper, one can infer the complexity of the Brazilian economy, which presents an advanced stage of a productive structure with a high interlinking degree among the national productive sectors.

As to the Agribusiness results, the empirical data show the fundamental role that this segment has performed in the Brazilian economy, responsible for approximately 27% of its GDP in

2000. In regards to the participation structure of the two major complexes of the Brazilian Agribusiness – Vegetal and Animal – one observes that the GDP of the Vegetal Agribusiness represents, around 20% of the Brazilian GDP, while the GDP of the Animal Agribusiness corresponds to approximately 8% of the Brazilian GDP. In the case of the Vegetal, the higher GDP share is explained in great part by the diversity of the agricultural sector, which has a larger number of processing industries than the animal sector. These results point out the importance and dependence of the other sectors of the economy in the agriculture, the share of 7.6%, in 2000, of the Brazilian agriculture in the national GDP is multiplied approximately 3.6 times when the Agribusiness concept is used.

Specifically with regards to the annual growth of the sub-complexes, one verifies that the Animal Product segment was the one presenting best results in the last years of analysis.

As to the share of the components of the Agribusiness GDP, one observes that the input contribution tended to grow for the total complex during the analyzed period, especially in the last three years (1998 to 2000). Although the Agriculture segment has presented a decreasing trend from 1994 to 1997 this has reversed in more recent years.

The evolution of the Brazilian Agribusiness composition also shows a high share of the Industry and the Distribution segments, as each segment has a share of around 33% of the total Agribusiness chain. This confirms that the processing and final distribution sectors are higher impulse vectors on the total value of the output sold to consumers, consolidated on the strong net connecting agriculture and industry.

One should stress that the basic methodology adopted here is integrated with the UN System of National Accounts and at the same time prevents the double count problem presented in usual works of Agribusiness GDP estimation. Due to the use of this new methodology one believes that the results achieved provide an accurate picture of what has been happening to the Brazilian Agribusiness, so as to provide the economic agents with subsidies for decision-making, besides decisively contributing to the methodological improvement of this sort of research.

Despite the study made here, there are still some questions left out and that need to be uncovered, like, how to measure the contribution of the a given culture to the agribusiness, how the regions interact among themselves in generating the value of the agribusiness, how the agriculture can take advantage of this more advanced and integrated process of production, and what should be the future of the agriculture in this new integrated setting.

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Figura 2. Variação anual do PIB do Complexo do Agronegócio Brasileiro - 1995 a 2000 (%)

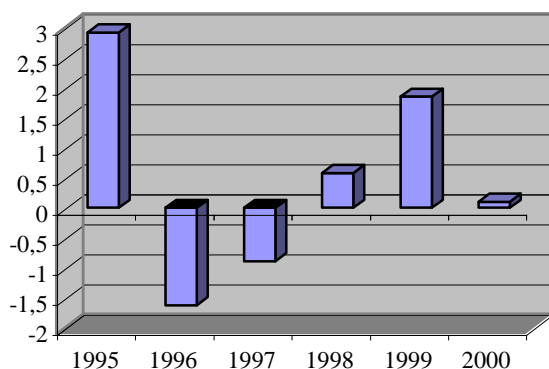


Figura 3. Variação anual do PIB do segmento a montante (insumos) do agronegócio brasileiro - 1995 a 2000 (%)

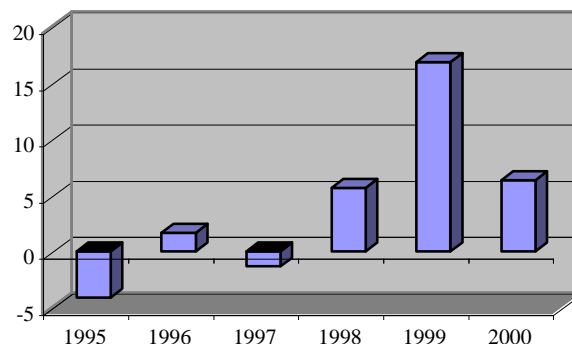


Figura 4. Variação anual do PIB da agropecuária brasileira - 1995 a 2000 (%)

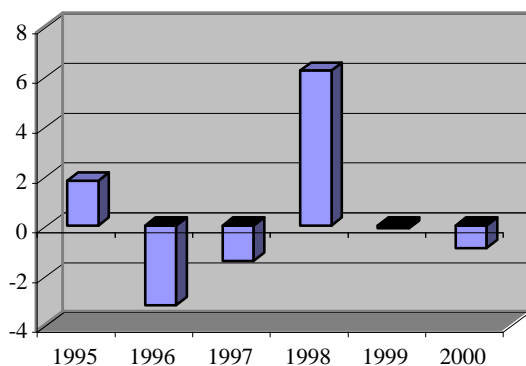


Figura 5. Variação anual do PIB do segmento a jusante (indústria de base agrícola) do agronegócio brasileiro - 1995 a 2000 (%)

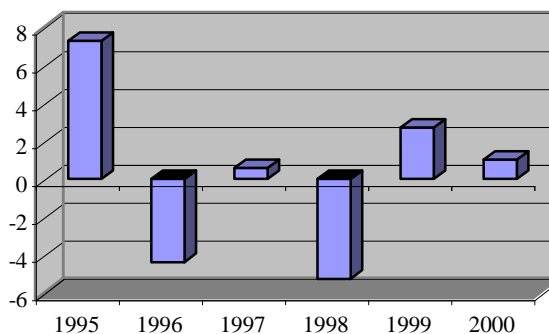
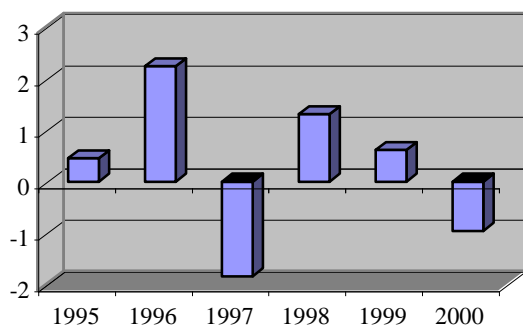


Gráfico 6. Variação anual do PIB do segmento a jusante (serviços) do agronegócio brasileiro - 1995 a 2000 (%)



Fonte: Tabela 5.